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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/719,876	11/21/2003	Warren M. Farnworth	01-1059.3	3067
22823	7590	12/01/2004	EXAMINER BEREZNY, NEMA O	
STEPHEN A GRATTON THE LAW OFFICE OF STEVE GRATTON 2764 SOUTH BRAUN WAY LAKEWOOD, CO 80228			ART UNIT 2813	PAPER NUMBER

DATE MAILED: 12/01/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

AK

Office Action Summary	Application No. 10/719,876	Applicant(s) FARNWORTH ET AL.	
	Examiner Nema O Berezny	Art Unit 2813	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 114-151 is/are pending in the application.
 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 142-151 is/are allowed.
- 6) ☒ Claim(s) 114-141 is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 21 November 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
 Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
 Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
 a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. ____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. ____. |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date <u>1/21/2003, 03/17/2004.</u> | 6) <input type="checkbox"/> Other: ____. |

DETAILED ACTION

Claims 114-151 are currently pending; cancellation of claims 1-113 and 152-260 is acknowledged.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claim 116 recites the limitation "the sealing layer" in lines 1-2. There is insufficient antecedent basis for this limitation in the claim.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 114, 117, 120, and 129 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shinogi et al. (6,534,387) in view of Wang et al (6,573,156). Shinogi discloses a method for fabricating semiconductor components comprising: providing a plurality of semiconductor dice (Figs.8A-9C el.20A) on a substrate (el.20) having a first side, a second side, and a plurality of die contacts (inherent) on the first side; forming a polymer layer (el.R) on the first side having a plurality of first slots (el.21) in a criss cross

pattern (implied for a wafer) between the dice (Fig.8A); and forming a plurality terminal contacts (el.12) the polymer layer electrical communication with the die contacts.

However, Shinogi does not disclose forming an etch mask and etching the substrate from the first and second sides, or etch said polymer layer. Shinogi would look to one such as Wang for easy separation and alignment because Wang discloses forming an etch mask on the second side having a plurality of second slots aligned with the first slots; and etching the substrate from the first side and the second side to singulate the dice (col.2 line 51 – col.3 line 7; col.4 lines 18-27; col.5 lines 41-48); and etching a polymer material (col.4 lines 28-32, 4-9). Therefore, it would have been obvious to a person of ordinary skill in the art at the time of the invention to use the mask and etching of Wang with the method of Shinogi in order to provide easy separation and alignment of the chips from the wafer during singulation (Wang - col.4 lines 27-35) **[claims 114, 120]**.

Based upon the rejection of claim 114 above, Shinogi also discloses forming contact bumps (el.8) on the die contacts, forming the polymer layer on the die contacts, planarizing the contact bumps and the patterned polymer layer, and singulating the dice from the substrate (Figs.8A-9A) **[claims 117, 129]**.

Claims 115, 121, 123-125, 128, and 130-131 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shinogi in view of Wang as applied to claims 114 and 117 above, and further in view of Wakabayashi (6,607,970). Shinogi in view of Wang do not disclose forming a sealing layer on the second side and edges of the dice,

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or applying tape to said second side. However, Shinogi and Wang would look to one such as Wakabayashi for device protection because Wakabayashi discloses following the etching step, forming a sealing layer on the second side and on edges of the dice to hermetically seal said side and said edges (col.5 lines 41-45). Therefore, it would have been obvious to a person of ordinary skill in the art at the time of the invention to use the sealing layer of Wakabayashi with the method of Shinogi and Wang in order to provide protection from light and electromagnetic waves applied to the device (Wakabayashi - col.5 lines 53-56) **[claims 115, 121, 123]**.

Wakabayashi also discloses following the thinning step applying a polymer tape to the second side (col.5 lines 29-36) **[claim 130]**; and wherein the polymer tape comprises a wafer level underfill material (Fig.14 el.17) **[claim 131]**. Therefore, it would have been obvious to a person of ordinary skill in the art at the time of the invention to use the polymer tape of Wakabayashi with the method of Shinogi and Wang in order to keep the individual dice together for complete processing prior to singulation (Wakabayashi - Fig.5).

Based upon the rejection of claim 121 above, Shinogi also discloses wherein the terminal contacts comprise conductive bumps or balls (Fig.9B) **[claim 124]**; wherein the forming the contact bumps step comprises attaching or depositing a solder material to the die contacts (col.6 lines 19-21) **[claim 125]**; and wherein the substrate comprises a semiconductor wafer having streets separating the dice, and the first slots align with the streets (Figs.8A,8C) **[claim 128]**.

Claim 116 is rejected under 35 U.S.C. 103(a) as being unpatentable over Shinogi in view of Wang as applied to claim 114 above, and further in view of "Advanced Coating". Shinogi and Wang do not disclose a sealing layer of parylene. However, Shinogi and Wang would look to one such as "Advanced ..." for uniform coating because "Advanced ..." discloses wherein the sealing layer comprises parylene (p.5,6). Therefore, it would have been obvious to a person of ordinary skill in the art at the time of the invention to use the parylene sealing layer of "Advanced ..." with the method of Shinogi and Wang in order to provide a sealing layer with uniform coating ("Advanced ..." - p.1 para.1).

Claim 118 is rejected under 35 U.S.C. 103(a) as being unpatentable over Shinogi in view of Wang as applied to claim 114 above, and further in view of Nikkel (2002/0097302). Shinogi in view of Wang do not disclose an etching step using KOH or TMAH. However, Shinogi and Wang would look to one such as Nikkel for an angled etch because Nikkel discloses wherein the etching step is performed using KOH in a first etch step, and TMAH in a second step (p.4 para.57). Therefore, it would have been obvious to a person of ordinary skill in the art at the time of the invention to use the etching of Nikkel with the method of Shinogi and Wang in order to provide an angled etch profile (Nikkel - p.3 para.56).

Claim 119 is rejected under 35 U.S.C. 103(a) as being unpatentable over Shinogi in view of Wang as applied to claim 114 above, and further in view of Chiang

(6,774,659). Shinogi in view of Wang do not disclose depositing said polymer through a stencil. However, Shinogi and Wang would look to one such as Chiang for predetermined positioning because Chiang discloses wherein the forming the polymer layer step comprises depositing a curable polymer through a stencil (col.10 lines 12-21). Therefore, it would have been obvious to a person of ordinary skill in the art at the time of the invention to use the stencil of Chiang with the method of Shinogi and Wang in order to provide predetermined positioning and locations (Chiang - col.10 lines 14-20).

Claim 122 is rejected under 35 U.S.C. 103(a) as being unpatentable over Shinogi in view of Wang and Wakabayashi as applied to claim 121 above, and further in view of Saitoh (6,060,373). Shinogi in view of Wang and Wakabayashi do not disclose attaching a tape to said first side. However, Shinogi, Wang and Wakabayashi would look to one such as Saitoh for holding the device secure because Saitoh discloses attaching a tape (Fig.1 el.13) to the first side, and performing backside substrate removing step and the applying step with the tape covering the polymer layer and the contact bumps (Fig.1). Therefore, it would have been obvious to a person of ordinary skill in the art at the time of the invention to use the tape of Saitoh with the method of Shinogi, Wang, and Wakabayashi in order to hold the device secure during backside processing.

Claims 126-127 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shinogi in view of Wang and Wakabayashi as applied to claim 121 above, and further in

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view of Nikkel (2002/0097302).). Shinogi in view of Wang and Wakabayashi do not disclose an etching step using KOH or TMAH. However, Shinogi, Wang, and Wakabayashi would look to one such as Nikkel for an angled etch because Nikkel discloses wherein the etching step is performed using KOH in a first submerged etch step, and TMAH in a second submerged step (p.4 para.57). Therefore, it would have been obvious to a person of ordinary skill in the art at the time of the invention to use the etching of Nikkel with the method of Shinogi, Wang, and Wakabayashi in order to provide an angled etch profile (Nikkel - p.3 para.56).

Claims 132-133 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shinogi in view of Wang and Wakabayashi as applied to claims 129-130 above, and further in view of Easton (2001/0040117). Shinogi, Wang, and Wakabayashi do not disclose marking said polymer tape. However, Shinogi, Wang, and Wakabayashi would look to one such as Easton for labeling a device because Easton discloses laser marking the polymer tape (p.2 para.16); and wherein the polymer tape is opaque to a radiation used for marking the polymer tape (p.6 para.60). Therefore, it would have been obvious to a person of ordinary skill in the art at the time of the invention to use the tape of Easton with the method of Shinogi, Wang, and Wakabayashi in order to provide laser labeling of the devices.

Claim 134 is rejected under 35 U.S.C. 103(a) as being unpatentable over Shinogi in view of Wang and Wakabayashi as applied to claim 129 above, and further in view of

Chien (2002/0009826). Shinogi, Wang, and Wakabayashi do not disclose attaching a heat sink. However, Shinogi, Wang, and Wakabayashi would look to one such as Chien for heat dissipation because Chien discloses following the thinning step, attaching a heat sink to the second side (p.2 para.25). Therefore, it would have been obvious to a person of ordinary skill in the art at the time of the invention to use the heat sink of Chien with the method of Shinogi, Wang, and Wakabayashi in order to remove heat from the device.

Claim 135 is rejected under 35 U.S.C. 103(a) as being unpatentable over Shinogi in view of Wang and Wakabayashi as applied to claim 129 above, and further in view of Tani et al. (6,080,602). Shinogi, Wang, and Wakabayashi do not disclose forming a dam. However, Shinogi, Wang, and Wakabayashi would look to one such as Tani for a planar upper polymer surface because Tani discloses wherein the forming the polymer layer step comprises forming a dam (Figs.3A-3C el.53) on the first side, depositing a curable material (el.52) within the dam, and then curing the curable material (col.3 line 57 – col.4 line 10). Therefore, it would have been obvious to a person of ordinary skill in the art at the time of the invention to use the dam of Tani with the method of Shinogi, Wang, and Wakabayashi in order to form a flat upper polymer surface (Tani – col.4 lines 5-7).

Claim 136 is rejected under 35 U.S.C. 103(a) as being unpatentable over Shinogi in view of Wang and Wakabayashi as applied to claim 129 above, and further in view of

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Chen et al. (6,221,751). Shinogi, Wang, and Wakabayashi do not disclose testing the dice. However, Shinogi, Wang, and Wakabayashi would look to one such as Chen for cost savings because Chen discloses testing the dice on the substrate prior to the singulating step (col.11 lines 65-67). Therefore, it would have been obvious to a person of ordinary skill in the art at the time of the invention to use the testing of Chen with the method of Shinogi, Wang, and Wakabayashi in order to minimize costs through wafer fabrication (Chen - col.12 lines 15-17).

Claims 137-141 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shinogi et al. (6,534,387) in view of Chien (2002/0009826). Shinogi discloses a method for fabricating semiconductor components comprising: providing a plurality of semiconductor dice (Figs.8A-9C el.20A) on a substrate (el.20) having a first side, a second side, and a plurality of die contacts (inherent) on the first side; forming a polymer layer (el.R) on the first side; thinning the substrate from the second side (Figs.8B-8C); and singulating the dice from the substrate to form each component with a first side encapsulated by the polymer layer and a thinned second side (Fig.9C). However, Shinogi does not disclose attaching a heat sink. Shinogi would look to one such as Chien for heat dissipation because Chien discloses attaching a heat sink to the thinned second side and wherein the attaching the heat sink step is performed using a thermally conductive adhesive (p.2 para.25). Therefore, it would have been obvious to a person of ordinary skill in the art at the time of the invention to use the heat sink of

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Chien with the method of Shinogi in order to remove heat from the device **[claims 137, 141]**.

Based upon the rejection of claim 137 above, Shinogi also discloses forming a plurality of terminal contacts (el.12) on the polymer layer in electrical communication with the die contacts **[claim 138]**; forming a plurality of contact bumps (el.8) on the die contacts encapsulated by the polymer layer (Fig.8A-9A) **[claim 139]**; and wherein the singulating step is performed by sawing, laser cutting or liquid jet cutting the substrate (col.6 lines 22-28) **[claim 140]**.

Allowable Subject Matter

The following is a statement of reasons for the indication of allowable subject matter for claims 142-151: the prior art of record does not teach or disclose or make obvious a method for fabricating semiconductor components, comprising inter alia: exposing and developing imageable polymer material to form polymer dams in trenches formed in a substrate surrounding individual dice; and depositing a second polymer material on the dice within the polymer dams. Shinogi et al. (6,534,387) discloses a similar method, except there is only one polymer material within the formed trenches (Figs.8A-9C).


Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Nema O Berezny whose telephone number is (571) 272-1686. The examiner can normally be reached on M-F 9-5:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Carl Whitehead, Jr. can be reached on (571) 272-1702. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

NB


Nema Berezny